FIG.1

START

RECEIVE SEQUENCE $\{W'_k, V'_k\}$ OF RECEIVED SIGNAL POINTS ~ST1

$\{W'_k, V'_k\}$

ST2

CALCULATE SOFT-DECISION INPUT VALUES $w'_{1,k}, w'_{0,k}, v'_{1,k}, v'_{0,k}$ of TURBO ENCODING AND HARD-DECISION VALUES $h(w'_{1,k}), h(w'_{0,k}), h(v'_{1,k}), h(v'_{0,k})$ OF LOW-ORDER BIT

$w'_{1,k} w'_{0,k} v'_{1,k} v'_{0,k}$

ST3

PERFORM TURBO ENCODING TO CALCULATE LOG-LIKELIHOOD RATIO $L(u_k)$ OF LOW-ORDER INFORMATION BIT

$L(u_k)$

ST4

CALCULATE ESTIMATED VALUE u'_k OF TRANSMITTED LOW-ORDER INFORMATION BIT

u'_k

END

ST5

CALCULATE ESTIMATD VALUES $u'_{z,k}, u'_{z-1,k}, \ldots, u'_{3,k}$ OF TRANSMITTED HIGH-ORDER INFORMATION BIT BY HARD-DECISION OF RECEIVED SIGNAL POINTS

$u'_{z,k} u'_{z-1,k}, \ldots, u'_{3,k}$

FIG.2

(a)

(b)

ex:
Tone#40:$W(w_3, w_2, w_1, w_0)$
Tone#41:$V(v_3, v_2, v_1, v_0)$

(c)

FIG.3

RECUSRIVE SYSTEMATIC CONVOLUTIONAL ENCODER 11

RECUSRIVE SYSTEMATIC CONVOLUTIONAL ENCODER 14

u_2
u_1
u_{0a}
u_{0b}

t: INTERLEAVER
t^{-1}: DEINTERLEAVER

FIG.4

(a)

B •   D •

A •   C •

(b)

G(10)   E(00)

B •   D •   B •   D •
(1001) (1011) (0001) (0011)

A •   C •   A •   C •
(1000) (1010) (0000) (0010)

B •   D •   B •   D •
(1101) (1111) (0101) (0111)

A •   C •   A •   C •
(1100) (1110) (0100) (0110)

H(11)   F(01)

(c)

B • D • B • D • B • D • B • D •
A 1001 C A 1011 C A 1001 C A 0011 C
• • • • • • • •

B • D • B • D • B • D • B • D •
A 1000 C A 1010 C A 0000 C A 0010 C
• • • • • • • •

B • D • B • D • B • D • B • D •
A 1101 C A 1111 C A 0101 C A 0111 C
• • • • • • • •

B • D • B • D • B • D • B • D •
A 1100 C A 1110 C A 0100 C A 0110 C
• • • • • • • •

(d)

COSET	w_1	w_0
A	0	0
B	0	1
C	1	0
D	1	1

(e)

AREA	w_3	w_2
E	0	0
F	0	1
G	1	0
H	1	1

FIG.5

START

↓

RECEIVE SEQUENCE {W'_k, V'_k} OF RECEIVED SIGNAL POINTS — ST11

↓ {W'_k, V'_k}

CALCULATE SOFT-DECISION INPUT VALUES $w'_{1,k}$ $w'_{0,k}$ $v'_{1,k}$ $v'_{0,k}$ of TURBO ENCODING AND HARD-DECISION VALUES $h(w'_{1,k})$, $h(w'_{0,k})$, $h(v'_{1,k})$, $h(v'_{0,k})$ OF LOW-ORDER BIT — ST12

↓ $w'_{1,k}$ $w'_{0,k}$ $v'_{1,k}$ $v'_{0,k}$, $h(w'_{1,k})$, $h(w'_{0,k})$, $h(v'_{1,k})$, $h(v'_{0,k})$

PERFORM TURBO ENCODING TO CALCULATE LOG-LIKELIHOOD RATIO $L(u_k)$ OF LOW-ORDER INFORMATION BIT AND LOG-LIKELIHOOD RATIO $L(u_{0a,k})$, $L(u_{0b,k})$ OF PARITY BIT — ST13

ST14 ↓ $L(u_k)$ ↓ $L(u_{0a,k})$, $L(u_{0b,k})$ ST15

CALCULATE ESTIMATED VALUE u'_k OF TRANSMITTED LOW-ORDER INFORMATION BIT

CALCULATE ESTIMATED VALUES $u'_{0a,k}$ $u'_{0b,k}$ OF TRANSMITTED PARITY BIT

↓ u'_k ↓ $u'_{0a,k}$ $u'_{0b,k}$

CALCULATE ESTIMATED VALUE $u'_{coset,k}$ OF TRANSMITTED COSET — ST16

↓ $u'_{coset,k}$

CALCULATE ESTIMATED VALUES w''_k v''_k OF TRANSMITTED SIGNAL POINTS — ST17

↓ w''_k v''_k

CALCULATE ESTIMATD VALUES $u_{z,k}$ $u'_{z-1,k}$ ···, $u'_{3,k}$, OF TRANSMITTED HIGH-ORDER INFORMATION BIT — ST18

↓ $u_{z,k}$ $u'_{z-1,k}$ ···, $u'_{3,k}$

END

FIG.6

BIT ERROR PROBABILITY

$E_b/N_0(dB)$

■ RELATED ART

▲ FIRST EMBODIMENT

FIG.7

RECEIVED SIGNAL POINTS
W', V'

FIG.8

(a)

HIGH-ORDER INFORMATION BIT DETERMINATION AREA 23

HIGH-ORDER INFORMATION BIT DETERMINATION AREA 24

RECEIVED SIGNAL POINT 21

ESTIMATED SIGNAL POINT ACCORDING TO RELATED ART 22

TRANSMITTED SIGNAL POINT 20

(b)

TRANSMITTED SIGNAL POINT 25

SQUARE EUCLIDEAN DISTANCE 27

RECEIVED SIGNAL POINT 26

(d)

COSET	$h(w'_{1,k})$	$h(w'_{0,k})$
A	0	0
B	0	1
C	1	0
D	1	1

(c)

TRANSMITTED SIGNAL POINT 25

DISTANCE FROM THRESHOLD VALUE 28

DISTANCE FROM THRESHOLD VALUE 29

RECEIVED SIGNAL POINT 26

COSET	$h(v'_{1,k})$	$h(v'_{0,k})$
A	0	0
B	0	1
C	1	0
D	1	1